8. If no force is required to hold an object in a particular frame of reference. It is called?

- A: High force system
- B: Gravity Free system
- C: Gravity pull system
- D: Netural system

9. The body moving along a circular path at constant speed has _____ velocity.

- A: Constant
- B: Variable
- C: Zero
- D: Increasing

10. The direction of centripetal force can be compared to centripetal acceleration as?

- A: In same direction
- B: In opposite direction
- C: Orthogonal to each other
- D: At 60^0 to each other.

11. If the frequency of a pendulum is four times greater on an unknown planet that it is on earth, then the gravitational constant on that planet is:

- A: 16 times greater
- B: 4 time greater
- C: 16 times lower
- D: 24 times lower

12. Your apparent weight differs from your true weight, at which points during the ride of an elevator?

- A: Start and end
- B: At the middle
- C: Through the whole path
- D: It is always same as true weight.

13. Moment of inertia in rotational motion plays same role as _____ in linear motion.

- A: Acceleration
- B: Momentum
- C: Mass
- D: Weight

14. Close orbiting satellites generally revolve at what height from the surface of the earth?

- A: 200 km
- B: 300 km
- C: 400 km
- D: 600 km

15. If a hoop is rolling down an inclined plane without slipping, its velocity at the bottom can be given by?

- A: $\sqrt{\frac{1}{2}gh}$
- B: $\sqrt{\frac{1}{4}gh}$
- C: $\sqrt{gh}$
- D: $\sqrt{gh^2}$

16. A disc without slipping rolls down the slope from a height of 10 m. If the disc starts from rest, what is its speed at the bottom?

- A: 10 $m.sec^{-1}$
- B: 11.4 $m.sec^{-1}$
- C: 13.6 $m.sec^{-1}$
- D: 18 $m.sec^{-1}$

17. Dimension of angular acceleration α is?

- A: [deg. T^{-2}]
- B: [T^{-2}]
- C: [rad. T^{-2}]
- D: LT^{-2}

18. A disc and a hoop are both sliding down on an inclined plane from the same height. On reaching the bottom, which one will be moving faster?

- A: Hoop
- B: Disc
- C: Both will come down with same velocity
- D: Insufficient data to analize.

19. In order to create an artificial gravity, the spaceship is?

- A: Revolved in a circular path
- B: Moved tangentially to its original path
- C: Rotated about its own axis
- D: Kept at constant distance from the earth.

20. If a frame of reference is falling freely, the force required to hold an object in that frame is?

- A: Greater than the weight of the body
- B: Less than the weight of the body
- C: Zero
- D: Equal to its weight

FLUID DYNAMICS

TEST-1

1. **Bernoulli's principle is based on the law of conservation of?**

   - A: Mass
   - B: Energy
   - C: Momentum
   - D: None of these.

2. **Equation of continuity states that?**

   - A: Flow per unit time of a fluid in a system remains constant.
   - B: Mass per unit area of a fluid in a system remains constant.
   - C: Density of a fluid in a system remains constant.
   - D: Flow rate continues to increase as the cross sectional area of pipes decrease.

3. **For what kind of flow fluid particles cannot be tracked?**

   - A: Laminar flow
   - B: Streamline flow
   - C: Turbulent Flow
   - D: Both A & B.

4. **As the viscosity of the air increases, the terminal velocity of the falling droplets?**

   - A: Remains same.
   - B: Increases at the same rate.
   - C: Decreases.
   - D: Increases at twice the rate.

5. **Which of the following liquids have smallest viscoity?**

   - A: Honey
   - B: Water
   - C: Tar
   - D: Oil

6. **Which one of the following substances has the greatest viscosity?**

   - A: Water
   - B: Mercury
   - C: Oxygen
   - D: Hydrogen

7. **Equation of continuity is based on the principle of conservation of?**

   - A: Mass
   - B: Energy
   - C: Momentum
   - D: None of the above.

8. Stoke's law gives?

- A: Velocity of a body moving in a fluid
- B: Drag force on spherical body moving in a fluid
- C: Defines relationship that AV = constant
- D: Terminal velocity of a spherical object moving in a viscuous fluid.

9. The equation of continuity is applicable when?

- A: Flow is steady
- B: Fluid is incompressible.
- C: Fluid mass is conserved.
- D: All of the above.

10. Viscocity is the measure of?

- A: Drag force on a moving body.
- B: Force required sliding on layer of liquid over another layer.
- C: Density of liquid.
- D: Thickness of liquid.

11. An object having spherical shape of radius 'r' experiences retarding force 'F' from a fluid coefficient of viscosity η when moving through a speed 'v'. What is the ratio of retarding force to speed?

- A: $6\pi\eta r^2$
- B: $6\pi\eta/r^2$
- C: $6\pi\eta r$
- D: $6\pi\eta/r$

12. Which of the following uses Bernoulli's principle in its operation?

- A: Airplane
- B: Formula one car
- C: Sail boat
- D: All of the above.

13. Bernoulli's Principle is a statement of?

- A: Hydrostatic equilibrium.
- B: Energy conservation in dynamic fluids.
- C: Mechanical equilibrium in fluids.
- D: All of the above.

14. Water flows at the rate of 5 m^3/s at the end of a hose with cross sectional area of 10 m^2. What is the speed of water at the end of the hose?

- A: 50 m/s
- B: 2.8 m/s
- C: 2 m/s
- D: 0.5 m/s

15. In the fluid flow, for the equation of continuity $A_1V_1 = A_2V_2$, if the velocity of fluid at one end is doubled, what will be cross sectional area at the other end

- A: Double
- B: Half
- C: $(\text{Double})^2$
- D: $(\text{Half})^2$

16. Drag force is a function of?

- A: Surface area of the body.
- B: Density of the fluid.
- C: Velocity of the body.
- D: All of the above.

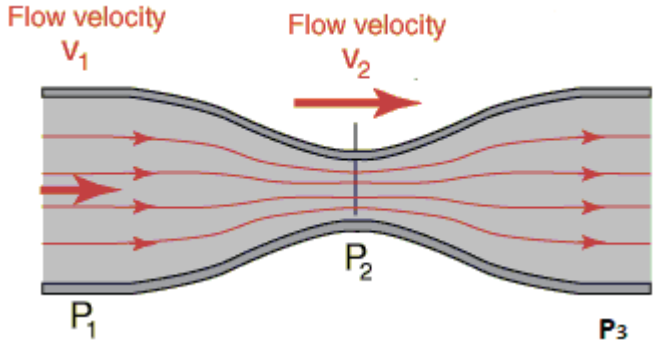
17. Bernoulli's equation relates pressure of fluid to which other qantities?

- A: Density & Height
- B: Density * Speed
- C: Speed & Heigth
- D: Area & Speed

18. An ideal fluid has which of the following properties?

- A: Obeys Newton's law of viscosity.
- B: Frictionless and incompressible
- C: Very viscuous
- D: Frictionless and compressible.

19. In the figure below speed of the fluid is highest at point?



- A: P1
- B: P2
- C: P3
- D: Same at all points.

20. Water is flowing through a pipe of constant cross-section. At some point the pipe becomes narrow and the cross-section is halved. The speed of water is?

- A: Reduced to zero.
- B: Increased by a factor of 2.
- C: Decrease by a factor of 2.
- D: Unchanged.

TEST-2

1. **If a small-tiny lead shot is gently dropped on the surface of a viscous fluid,**
   - A: the lead shot will fall with an acceleration equal to g.
   - B: the velocity of lead shot will decrease with time.
   - C: the velocity of lead shot will increase with time.
   - D: the velocity of lead shot will reach a steady value after some time.

2. **Which one of the following is the characteristic of a fully developed laminar flow?**
   - A: The pressure drop in the flow direction is zero.
   - B: The velocity profile changes uniformly in the flow direction.
   - C: The velocity profile does not change in the flow direction.
   - D: None of the above.

3. **For an incompressible fluid in a pipe system?**
   - A: Pressure always remains constant
   - B: In horizontal flow highest speed occurs when the pressure is lowest.
   - C: In horizontal flow lowest speed occurs when the pressure is lowest.
   - D: Bernoulli's equation is not applicable to incompressible liquids.

4. **For water flowing through a piping system, the cross sectional area of pipes after point P is halved. The speed of water beyond the point P?**
   - A: Decreases by 1/2
   - B: Increases by 1/2
   - C: Remains Same
   - D: Increases by 2 times

5. **For aeroplane to lift, which of the following conditions must be true?**
   - A: Air on the top part of the wing must be travelling faster than the lower part of the wing.
   - B: Air on the top part of the wing must be travelling slower than the lower part of the wing.
   - C: Air on the top part of the wing must be travelling at same speed as on the lower part of the wing.
   - D: None of the above.

6. **A person holds their hand out of a car window while driving through still air at a speed of V_{car}. What is the maximum pressure on the person's hand?**
   - A: $P_{max} = 1/2\rho V_{car}^2$
   - B: $P_{max} = P + 1/2\rho V_{car}^2$
   - C: $P_{max} = P + 1/2\rho V_{car}$
   - D: Not enough information given.

7. **Within a fluid flowing horizontally?**
   - A: Lowest speed occurs where the pressure is highest.
   - B: Lowest speed occurs where the pressure is lowest.
   - C: Pressure remains constant.
   - D: Speed is independent of pressure in horizontal flow.

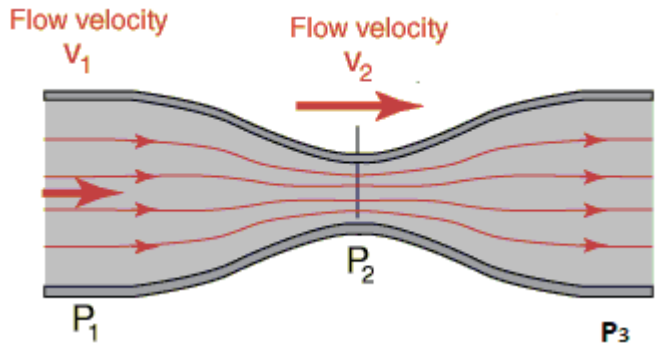
8. **For a liquid flowing in a pipe in horizontal direction, which of the following must remains constant?**

- A: Pressure energy.
- B: Kinetic energy per unit volume.
- C: Potential energy per unit volume.
- D: As per Bernoulli's theorum all of them would change.

9. **Stoke's law is given by:**

- A: $F=6\lambda\eta r^2 v$
- B: $F=6\lambda\eta r v^{-1}$
- C: $F=6\lambda\eta r^2 \rho$
- D: $F=6\lambda\eta r v$

10. **If $V_1 = 0.2$ m/s and $V_2 = 2$ m/s in the figure below. What is the difference between pressure at P1 and P2. Density of water = 1000 kg/m^3.**



- A: 1000 N/m^2
- B: 2000 N/m^2
- C: 2560 N/m^2
- D: 1980 N/m^2

11. **Flow speed of the fluid through a non-uniform pipe increases from 1m/sec to 3 m/sec . If change in potential energy is zero then pressure difference between two points will be? (density of the fluid 1000 kg /m^3)**

- A: 3000 N/m^2
- B: 4000 N/m^2
- C: 1000 N/m^2
- D: 9000 N/m^2

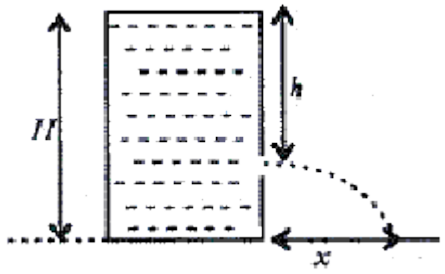
12. **The cylindrical tube of a spray pump has a cross-section of 8 cm^2, one end of which has 40 fine holes, each of area 10^{-8} m^2. If the liquid flows inside the tube with a speed of 0.15 m min^{-1}, the speed with which the liquid is ejected through the holes is?**

- A: 50 m/s
- B: 5 m/s
- C: 0.5 m/s
- D: 0.05 m/s

13. **Study of fluids in motion is made simpler by using which conservation principle / principles?**

- A: Conservation of Mass
- B: Conservation of Energy
- C: Both A & B
- D: None of the above

14. Which of the following phenomena is resulting in the efflux of fluid in the figure below?



- A: Kinetic energy at height H is being transferred to Kinetic energy at depth h.
- B: Potential energy at height H is being transferred to Kinetic energy at depth h.
- C: Potential energy at height H is being transferred to Potential energy at depth h.
- D: Pressure at height H is higher that pushes the water out at depth h.

15. As the drop of water falls down the drag force on it?

- A: Increases
- B: Decreases
- C: Remains constant
- D: Depends on the the size of the droplet.

16. Viscosity is the property of liquids by virtue of which?

- A: Liquid opposes relative motion of its parts.
- B: Liquid pushes neighbouring moleclues.
- C: Liquid attracts other molecules.
- D: None of these.

17. If each particle in a fluid motion passes through the same point as followed by earlier particle. The flow is said to be?

- A: Streamline
- B: Laminar
- C: Turbulent
- D: Both A & B

18. A manometer connected to a closed tap reads 4.5×10^5 Pa. When the tap is opened, the reading of the manometer falls to 4×10^5 Pa. What is the velocity of flow of water?

- A: 7 m/s
- B: 8 m/s
- C: 9 m/s
- D: 10 m/s

19. Drag force on an spherical object increases with?

- A: Increase in velocity
- B: Increase in viscosity of medium
- C: Increase in surface area of the object.
- D: All of the above.

20. Water at a gauge pressure of 3.8 atm at street level flows in to an office building at a speed of 0.06 m/s through a pipe 5.0 cm in diameter. The pipes taper down to 2.6 cm in diameter by the top floor, 20 m above. Calculate the flow velocity in such a pipe on the top floor.

- A: 2.2 m/s
- B: 5.8 m/s
- C: 0.11 m/s
- D: None of the above.

TEST-3

1. **For the horizontal pipe, the fluid inside it is flowing horizontally then Bernouli's equationcan be written as:**

   - A: $P + \rho v^2 = \text{constant}$
   - B: $P + v^2 = \text{constant}$
   - C: $2P + \rho v^2 = \text{constant}$
   - D: $2P + 2\rho v^2 = \text{constant}$

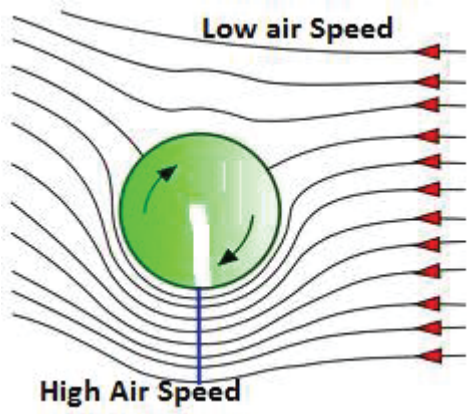
2. **A small spherical ball falling through a viscous medium of negligible density has terminal velocity 'v' Another ball of the same mass but of radius twice that of the first one falling through the same viscous medium will have terminal velocity?**

   - A: 2v
   - B: v/4
   - C: v/2
   - D: $(v/2)^{1/2}$

3. **As water from tap falls the cross sectional area of water flows?**

   - A: Remains same
   - B: Increases
   - C: Decreases
   - D: None of the above

4. **In the figure below, In which direction would you expect the ball to swing? Use the information given in the figure**



   - A: Upwards
   - B: Downwards
   - C: No swing
   - D: Need information about pressure to answer the question.

5. **Bernoulli's theorem implies that?**

   - A: In a steady flow, the sum of all forms of mechanical energy in a fluid along a streamline is the same at all points on that streamline.
   - B: The sum of kinetic energy and potential energy remain constant.
   - C: An increase in the speed of the fluid occurs proportionately with an increase in both its kinetic energy, and a decrease in its static pressure and potential energy.
   - D: All of the above.

6. **Water circulates throughout a house in a hot-water heating system. If water is pumped out at a speed of 0.50 m/s through a 4.0 cm diameter pipe in the basement under a pressure of 3.0 atm, what will be the flow speed and pressure in a 2.6 cm diameter pipe on the second floor 5.0 m above? Assume pipes do not divide into branches and 1 atm = 100 KPa**

- A: 0.5×10^5 N/m^2
- B: 1.5×10^5 N/m^2
- C: 2.5×10^5 N/m^2
- D: 3.5×10^5 N/m^2

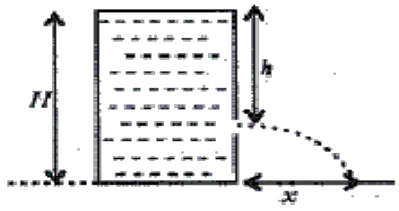
7. **Major loss of energy in long pipes is due to?**

- A: Sudden enlargement.
- B: Sudden contraction.
- C: Both A & B
- D: Friction.

8. **What is the lift (in newtons) due to Bernoulli's principle on a wing of area 100 m^2 if the air passes over the top and bottom surfaces at speeds of 340 m/s and 290 m/s, respectively? Assume density is 1.3 kg/m^3.**

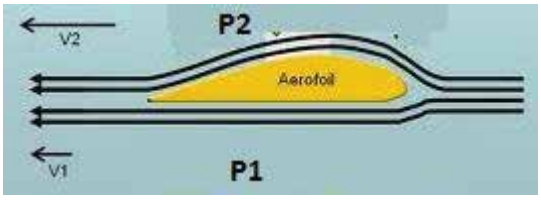
- A: 2.0×10^3 N
- B: 2.0×10^4 N
- C: 2.0×10^5 N
- D: 2.0×10^6 N

9. **The water filled in a tank has a hole 'h' meters from the top. Find the distance 'x' where the stream of water will touch the ground from the bottom.**



- A: $\sqrt{2gh}$
- B: $\sqrt{2g(H-h)}$
- C: $2g(H-h)$
- D: $2\sqrt{h(H-h))}$

10. **With reference to the figure of an airplane wing as shown below, if $V_2 > V_1$, which of the following is true?**



- A: $P_2 > P_1$ and the plane is taking off.
- B: $P_2 > P_1$ and the plane is landing.
- C: $P_1 > P_2$ and the plane is taking off.
- D: $P_1 > P_2$ and the plane is landing.

11. For a sphere moving in a viscuous medium, if the speed is increased by 10 times the drag force?

- A: Increases by 10 times
- B: Incrases by 5 times
- C: Remains same
- D: Cannot answer with given information.

12. Plant Zoro has half the force of gravity than that of earth. What is the terminal velocity of a falling spherical body on Zoro as compared to earth? Assume all other factors in planet Zoro are same as that of the Earth.

- A: Same as that on the earth.
- B: Higher than that on the earth.
- C: Lower than that on the earth.
- D: Not enough information to answer the question.

13. An incompressible fluid flows steadily through a cylindrical pipe, which has radius '2r' at point 'A' and radius 'r' at 'B' along the direction of the flow. If the velocity at point 'A' is 'v', its velocity at point 'B' is?

- A: 2V
- B: V
- C: V/2
- D: 4V

14. If speed of efflux through a small hole in a large tank is 9.8 m/s . Find the height of fluid above the hole?

- A: 9.8m
- B: 4.9m
- C: 19.6m
- D: 1m

15. Which of the following shows the condition of terminal velocity?

- A: $\int_{t1}^{t2} a\,dt = constant$
- B: $\int_{t1}^{t2} a\,dt = positive$
- C: $\int_{t1}^{t2} a\,dt = negative$
- D: $\int_{t1}^{t2} a\,dt = zero$

16. A metallic ball of radius 'r' falls in a tank of liquid at the instant when its acceleration is one-half that of a freely falling body. (The densities of metal and of liquid are ρ and σ respectively, and the viscosity of the liquid is η) What is the velocity 'v' of the metallic ball?

- A: $\frac{r^2 g}{9\eta}(\rho - 2\sigma)$
- B: $\frac{r^2 g}{9\eta}(2\rho - \sigma)$
- C: $\frac{r^2 g}{9\eta}(\rho - \sigma)$
- D: $\frac{2r^2 g}{9\eta}(\rho - \sigma)$

17. Water hose with internal radius of 0.01 m has water flowing at the rate of 10 kg per 20 s. What is the water speed at the outlet? Density of water is 1000 kg/$m^{3.}$

- A: 1.6 m/s
- B: 2.8 m/s
- C: 3.2 m/s
- D: 3.8 m/s

18. A hose with cross sectional area "A" has a fluid flowing at the rate of "M" kg/s. What is the speed of the fluid at the the outlet of the hose if its density is D?

- A: V = D / (M * A)
- B: V = M / (D * A)
- C: V = (D * A) / M
- D: V = M * D / (A)

19. $\lim_{\Delta t \to 0} \Delta v / \Delta t$ **for terminal velocity is?**

- A: Zero
- B: Positive
- C: Negative
- D: Constant

TEST-4

1. **When cooking oil is heated it becomes more fluid because?**

   - A: Viscosity decreases with increase in temperature.
   - B: Viscosity increases with increase in temperature.
   - C: As per Bernoulli's principle, the increase in temperature results in the liquids becoming more fluid.
   - D: Effect of heat radiation results in fluidity.

2. **Mass flow per second of fluid is given by**

   - A: ρAv
   - B: Av/ρ
   - C: Av
   - D: ρv

3. **Exact path of a particle in a moving fluid cannot be predicted in?**

   - A: Streamline flow
   - B: Laminar Flow
   - C: Turbulent Flow
   - D: All of the above.

4. **Dimensions of dynamic viscosity are?**

   - A: L^2T^{-1}
   - B: $L^{-1}T^{-1}$
   - C: $ML^{-1}T^{-1}$
   - D: $ML^{-1}T^{-2}$

5. **Which of the following characteristics at a point do not change over time for a steady flow?**

   - A: Density
   - B: Velocity
   - C: Pressure
   - D: All of the above.

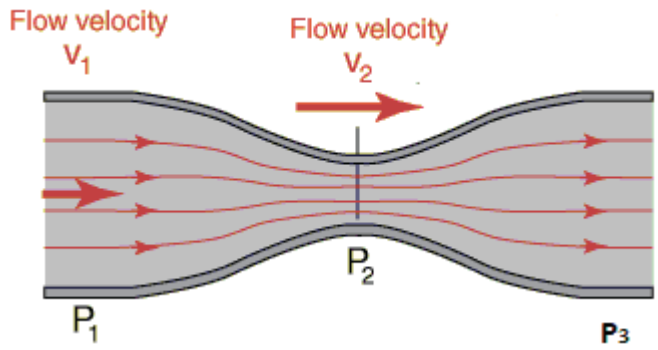
6. **Units of dynamic viscosity are?**

   - A: Kg m / s
   - B: Kg / (ms)
   - C: Kg m / s^2
   - D: Kg s / m

7. **As temperature increases the viscosity of fluids?**

   - A: Increases
   - B: Decreses
   - C: Remains same.
   - D: It may increase or decrease dependent on the nature of the fluid.

8. **Which of the following is true regarding the pressure at points P_1, P_2 & P_3 for the figure below?**



- A: $P_1 = P_2 = P_3$
- B: $P_1 = P_3 > P_2$
- C: $P_1 = P_3 < P_2$
- D: $P_1 \neq P_2 \neq P_3$

9. **Equation of continuity is not applicable to?**

- A: Laminar flow
- B: Viscuous liquids
- C: Turbulent flow
- D: Both B & C.

10. **When a body is moving with terminal velocity the acceleration becomes?**

- A: Positive.
- B: Zero
- C: Negative
- D: Variable.

11. **Energy losses are highest in which kind of flow?**

- A: Laminar flow
- B: Transition flow
- C: Turbulent flow
- D: Critical flow

12. **Sphygmamanometer is an instrument used to measure?**

- A: Pressure in water pipes.
- B: Air pressure.
- C: Blood pressure.
- D: Steam pressure.

13. **As the drag force on a falling droplet of water equals the weight of the drop, its velocity?**

- A: Increases
- B: Decreases
- C: Remains constant
- D: Depends on the size of the drop.

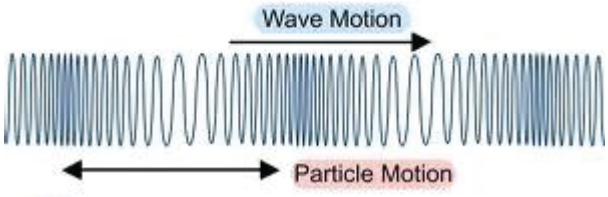
14. **A hydraulic automobile lift is designed to lift cars with a maximum mass of 3000 kg. The area of cross-section of the piston carrying the load is 425 cm^2. What maximum pressure would the smaller piston have to bear? (Given, g = 9.8 ms^{-2}).**

- A: 6.92×10^5 Nm^{-2}
- B: 3.46×10^5 Nm^{-2}
- C: 6.92×10^6 Nm^{-2}
- D: 69.2 Nm^{-2}

WAVES & OSCILATIONS

TEST-1

1. The figure below showed which kind of wave?



- A: Traverse wave
- B: Longitudinal wave
- C: Pulse
- D: None of the above.

2. Number of beats produced per second by two tuning forks of frequency 324Hz and 320Hz is?

- A: 2
- B: 4
- C: 8
- D: 16

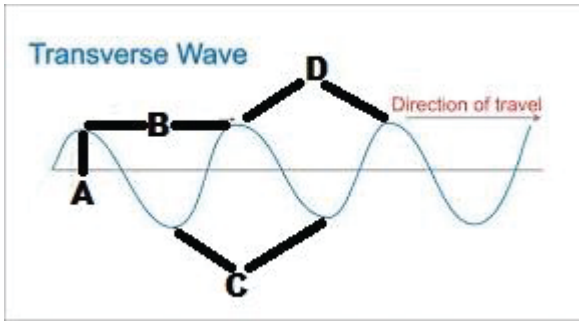
3. Which of the following is the mathematical representation of the acceleration of the simple harmonic motion?

- A: a α -x
- B: a α x
- C: a α -1/x
- D: a α 1/x

4. The distance between any two consecutive crests of throughs in the periodic waves is equal to?

- A: λ
- B: λ/2
- C: λ/3
- D: λ/4

5. In the figure below A, B, C and D represent?



- A: Crest, Trough, Amplitude and Wavelength respectively.
- B: Wavelength, Amplitude, Through and Crest respectively.
- C: Amplitude, Wavelength, Crest and Trough respectively.
- D: Amplitude, Wavelength, Trough and Crest respectively.

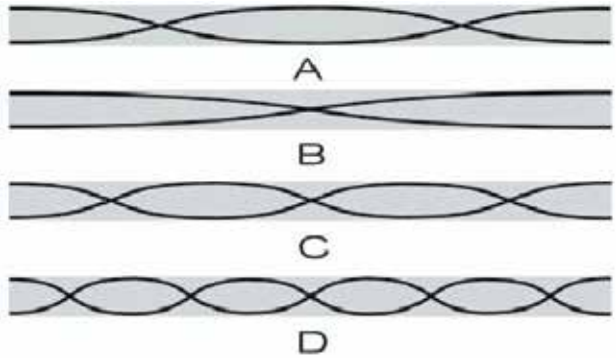
6. **Which of the following statement defines the Simple Harmonic Motion (SHM)?**

- A: A motion with constant retarding force
- B: A motion where energy is not conserved.
- C: Oscillatory motion without a restoring force.
- D: Oscillatory motion under a restoring force.

7. **Which of the following is the correct expression for the Simple Harmonic Motion of a mass attached to a spring?**

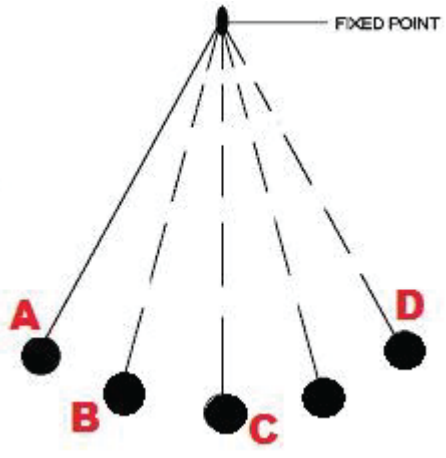
- A: $v = v_o\sqrt{1 - \frac{x^2}{x_o^2}}$
- B: $v = v_o\sqrt{1 + \frac{x^2}{x_o^2}}$
- C: $v = v_o\sqrt{1 - x^2}$
- D: $v = v_o\sqrt{1 - \frac{x^2}{2x_o^2}}$

8. **Which of the diagrams shows the pipe containing waves with the longest wavelength?**



- A: A
- B: B
- C: C
- D: D

9. **Kinetic energy of the pendulum bob is highest at which point?**



- A: A
- B: B
- C: C
- D: A and D

10. Mathematical formula of maximum velocity for a body executing simple harmonic motion is :

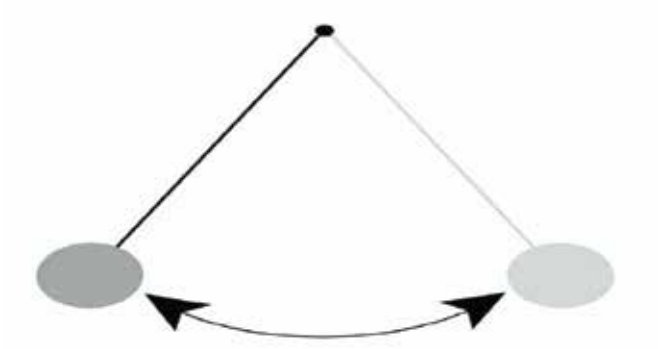
- A: $v = \omega\sqrt{x_o^2 - x^2}$
- B: $v = \omega\sqrt{x_o^2}$
- C: $v = \sqrt{x_o^2 - x^2}$
- D: $v = \omega\sqrt{x_o^2 - x^2}$

11. An observer moves with a velocity v towards a stationary source, the number of waves received in one second will be :

- A: $f^{'} = f\left(\frac{v + u_s}{u_s}\right)$
- B: $f^{'} = f\left(v + u_s\right)/v$
- C: $f^{'} = (u/(v + u_s))f$
- D: $f^{'} = (v/(v + u_s))f^2$

12. Which of the following is the Laplace's expression for the speed of sound in the gasses?

- A: $v = \sqrt{\frac{E}{\rho}}$
- B: $v = \sqrt{\frac{P}{\rho}}$
- C: $v = \sqrt{\frac{\gamma P}{\rho}}$
- D: $v = \sqrt{\frac{\gamma E}{\rho}}$



13. A pendulum is used on Earth and then transported to the moon where it is released and allowed to swing freely. Which of the following statements about the pendulum is correct?

- A: The period of the pendulum on the moon is greater than it was on Earth.
- B: The frequency of the pendulum on the moon is greater than it was on Earth.
- C: The potential energy of the pendulum on the moon is greater than it was on Earth.
- D: The kinetic energy of the pendulum on the moon is greater than it was on Earth.

14. Which of the following statement is correct?

- A: Waves transport energy and matter.
- B: Waves transport energy without transporting matter.
- C: Waves transport matter without transporting energy.
- D: Waves transport neither matter nor energy.

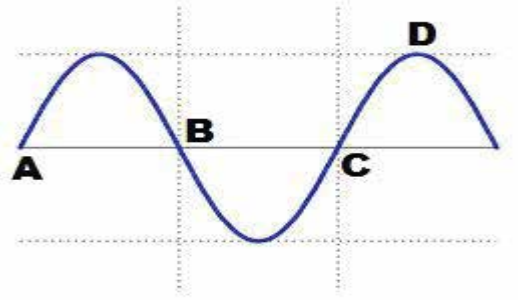
15. The direction of reflected wave remains the same when?

- A: A traverse wave travelling in a rare medium is reflected back by a denser medium.
- B: A traverse wave travelling in a dense medium is reflected back by a rarer medium.
- C: A traverse wave travelling in a dense medium is reflected back by a denser medium.
- D: A traverse wave travelling in a dense medium is reflected back by a similar medium.

16. Due to some mechincal fault a lift falls freely from the top of a multistory building. Which of the followings is the apparent weight of a man inside the lift if mass of man is 80kg while value of g is $10m/s^2$?

- A: 900 N
- B: 800 N
- C: Zero
- D: 700 N

17. Which of the following choices show the interval of a one full vibration in the given figure?



- A: AB
- B: AC
- C: AD
- D: BD

18. Harmonic series in the stationary waves is determined by?

- A: Length of the string.
- B: Tension of the string.
- C: Mass per unit length.
- D: All of the above.

19. A body oscillates due to which kind of force?

- A: Frictional force
- B: Rotationary force
- C: Periodic force
- D: Restoring force

20. If E is the elastic modulus and *p* is the density. The speed of sound is given by?

- A: $v = E/p$
- B: $v = p/E$
- C: $v = (E/p)^{1/2}$
- D: $v = (p/E)^{1/2}$

TEST-2

1. **When source of sound moves towards the stationary observer , the value of apperent frequency ;f_s' is:**

   A: $\therefore f' = f\left(1 + \frac{v}{c}\right)$

   B: $f_2 = \left(\frac{v+b}{v}\right)f$

   C: $f' = \frac{f}{\left(1+\frac{v_s}{v}\right)}$

   D:

2. **When two tuning forks (fork 1 and fork 2) are sounded simultaneously, 4 beats per second are heard. Now, some tape is attached on the prong of the fork 2. When the tuning forks are sounded again, 6 beats per second are heard. If the frequency of fork 1 is 200 Hz, then what was the original frequency of fork 2?**

   A: 200 Hz

   B: 204 Hz

   C: 196 Hz

   D: 194 Hz

3. **Newton's formula for the speed of sound in air is?**

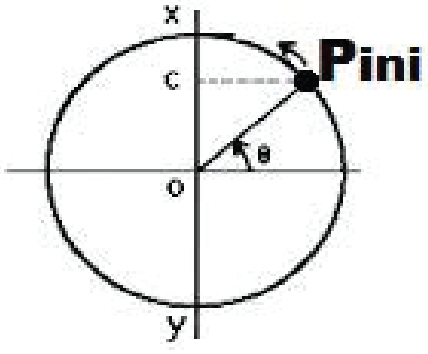
   A: $v = \sqrt{\frac{E}{\rho}}$

   B: $v = \sqrt{\frac{P}{\rho}}$

   C: $v = \sqrt{\frac{\gamma P}{\rho}}$

   D: $v = \sqrt{\frac{\gamma E}{\rho}}$

4. **If P_{ini} is the initial position of the object moving in a circle with angular velociy ω. Which of the following is the correct representation of the instantaneous position of the Simple Harmonic Motion of the projection OC?**



   A: OC = sin (ωt)

   B: OC = sin (ωt + Θ)

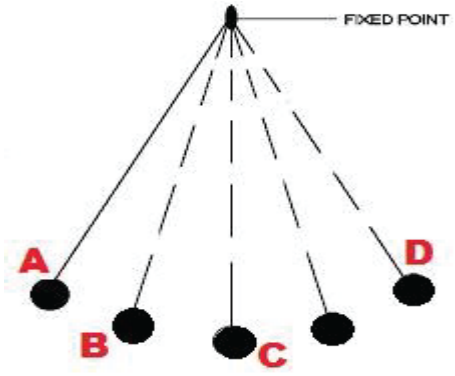
   C: OC = cos (ωt)

   D: OC = cos (ωt + Θ)

5. Two waves have destructive interference when path difference Δs =?

- A: nλ/2 where n = set of integers.
- B: nλ where n = set of integers.
- C: (2n+1)λ/2 where n = set of integers.
- D: (2n+1)λ/3 where n = set of integers.

6. PE of the pendulum bob is highest at which position?



- A: A
- B: B
- C: C
- D: Both A and D

7. A simple harmonic oscillator has a time period of 10 seconds. Which equation relates its acceleration 'a' and displacement 'x'?

- A: $a = -10x$
- B: $a = -(20\pi)x$
- C: $a = -(20\pi)^2x$
- D: $a = -(2\pi/10)^2x$

8. If a transverse wave is moving in the positive *x*-direction, its oscillations may occur in up and down directions in which plane?

- A: x plane or -x plane.
- B: y plane only.
- C: z plane only.
- D: y plane or z plane.

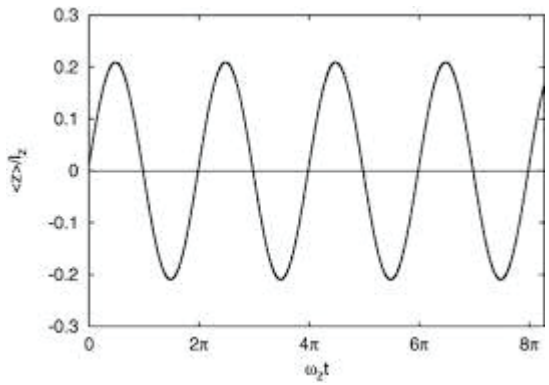
9. If a transverse wave is moving in the positive *x*-direction, its oscillations may occur in up and down directions in which plane?

- A: x plane or -x plane.
- B: y plane only.
- C: z plane only.
- D: y plane or z plane.

10. For the frictionless motion of a pendulum which of the following remains constant?

- A: Velocity
- B: Acceleration
- C: Potential energy
- D: Total energy.

11. Variation of amplitude with respect to time for an oscillating object is shown in figure:



Identify the oscillation:

- A: Damped
- B: Critical
- C: Heavily damped
- D: Undamped

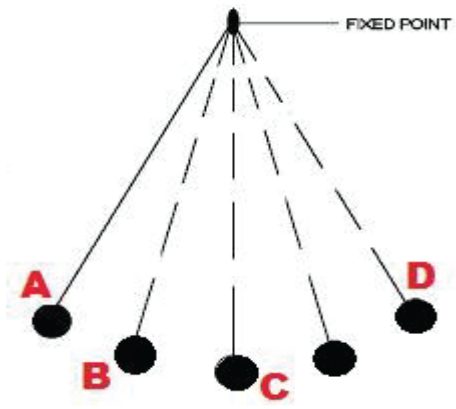
12. If the speed of sound in the air at 0^o C is 332 m/s. Then what is the speed at 5^o C?

- A: 330 m/s
- B: 332 m/s
- C: 334 m/s
- D: 335 m/s

13. A submarine sends out a sonar signal (sound wave in a direction directly downward. It takes 2.3 s for the sound wave to travel from the submarine to the ocean bottom and back to the submarine. How high (approx) up from the ocean floor is the submarine? (the speed of sound in water is 1,490 m/s)

- A: 3400m
- B: 1700m
- C: 50000m
- D: 9000m

14. For the figure given below, the velocity of the pendulum bob is the maximum at which point?



- A: A
- B: B
- C: C
- D: Both A and D

15. A simple pendulum consists of a bob, which is a hollow sphere containing mercury suspended by means of a wire. If the mercury is drained out from a small hole at the bottom, the period of the pendulum will? (assume that mercury is drained suddently in no time)

- A: Increase gradually and then attain a constant value.
- B: Increase
- C: Decrease
- D: Remain same

16. What is the distance between a node and the next anti-node in the stationary waves?

- A: λ
- B: $\lambda/2$
- C: $\lambda/3$
- D: $\lambda/4$

17. What is the the period of mass spring system during SHM if the ratio of mass to spring constant is 1/4?

- A: pi
- B: 2pi
- C: 1/pi
- D: 1/2pi

18. Frequency of simple pendulum of length 9.8m will be?

- A: 2π Hertz
- B: $\pi/2$ Hertz
- C: $1/2\pi$ Hertz
- D: $\pi/4$ Hertz

19. At what temperature the velocity of sound in air is three times the velocity at 10^{o}C?

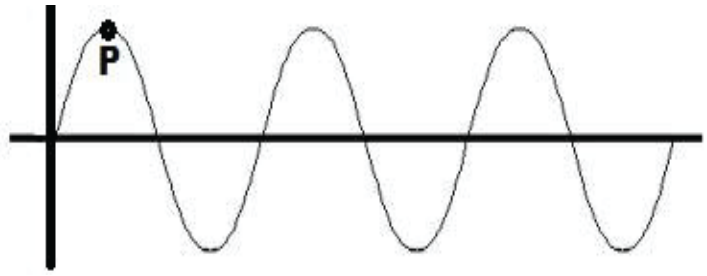
- A: 2274^{o}C
- B: 849^{o}C
- C: 576^{o}C
- D: 2547^{o}C

20. Which of the following quantities would not affect the speed of the sound in the gases?

- A: Pressure
- B: Temperature
- C: Density
- D: They all affect the speed of sound in the gas.

TEST-3

1. **For the give graph of sinosidal wave, any point at a distance x on positive x-axis would lead the point P by phase angle?**



- A: $\pi x/\lambda$
- B: $\pi x/2\lambda$
- C: $2\pi x/\lambda$
- D: $4\pi x/\lambda$

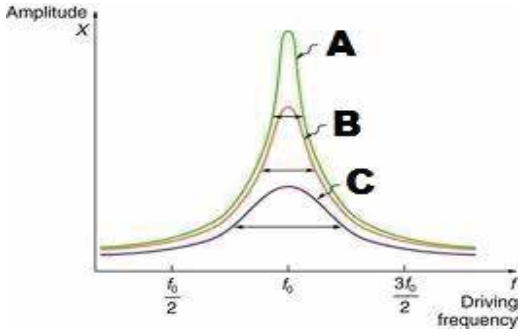
2. **An open pipe is suddenly closed at one end with the result that the frequency of third harmonic of the closed pipe is 100 Hz higher than the fundamental frequency of the open pipe. The fundamental frequency of the open pipe is?**

- A: 100 Hz
- B: 200 Hz
- C: 300 Hz
- D: 400 Hz

3. **An oscillating pendulum is allowed to fall freely under gravity along with its support. The time period of the oscillation will?**

- A: Increase
- B: Decrease
- C: Remain same
- D: Become infinite

4. **Which of the following resonating frequency curve has the highest damping?**



- A: A
- B: B
- C: C
- D: We do not have enough information to answer the question.

5. **In the forced oscillation of a particle, the amplitude is maximum for a frequency ω_1 of the force while the energy is maximum for a frequency ω_2 of the force. Then?**

- A: $\omega_1 = \omega_2$
- B: $\omega_1 > \omega_2$
- C: $\omega_1 < \omega_2$
- D: None of the above.

6. **For vibrating mass-spring system, the expression of kinetic energy at any displacement 'x' is given by:**

- A: $1/2m\omega(x_o^2-x^2)$
- B: $1/2kx_o^2$
- C: $1/2\ kx_o^2[1- x^2/x_o^2]$
- D: $1/2m\omega^2x_o$

7. **A boat at anchor is rocked by waves whose crests are 100 m apart and the velocity is 25 m/s. The boat bounces up once every_____.**

- A: 2500 s
- B: 75 s
- C: 4 s
- D: 0.25 s

8. **Two masses m_1 and m_2 are suspended together by a mass-less spring of spring constant K. When the masses are in equilibrium, m_1 is removed without disturbing the system. The amplitude of the oscillation of m_2 is?**

- A: m_1g/k
- B: m_2g/k
- C: m_1k/g
- D: m_2k/g

9. **If the tension of the string is increased by four times the fundamental frequency of harmonic series of stationary waves would?**

- A: Increase by four times.
- B: Decrease by four times.
- C: Increase by two times.
- D: Decrease by two times.

10. **The particle harmonic motion has a kinetic energy $K_0 \sin^2 \omega t$. The maximum values of the potential energy, and the total energy are respectively?**

- A: $K_o/2$ and K_o
- B: $K_o/2 \cos \omega t$ and $K_o \omega t$
- C: $K_o/2$ and $2K_o$
- D: K_o and K_o

11. **If the tension in the string and the length of the string are both increased by four times, the fundamental harmonic frequency of the stationary wave would?**

- A: Remain same.
- B: Decrease by half.
- C: Increase by two times.
- D: Decrease by 1/4.

12. **The instantaneous displacement of a simple harmonic oscillator is given by $y = A \cos t (\omega t + \pi/4)$. Its speed will be Minimum at the time?**

- A: $2\pi/\omega$
- B: $\omega/2\pi$
- C: ω/π
- D: $-\pi/4\omega$

13. **Two pendulums of same length oscillate with the same amplitude but with a constant phase difference of 90°. If the maximum velocity of one is v, the maximum velocity of the other will be?**

- A: 2v
- B: v/2
- C: v
- D: $\sqrt{v}$

14. A particle of mass 0.1 kg is held between two springs of spring constant 8N/m and 2N/m. If this particle is displaced along the length of spring, what will be the time period of vibration of spring?

- A: $\pi/2$ s
- B: $\pi/3$ s
- C: $2\pi/3$ s
- D: $\pi/5$ s

15. What should be the ratio of K.E to the total energy in Simple harmonic motion :

- A: $\left(1 - x^2/x_o^2\right)$
- B: 1
- C: $\left(x^2/x_o^2\right)$
- D: $1/2x$

16. Two identical organ pipes are producing fundamental notes of frequencies 200 hz at 15°C. If the temperature of one pipe is raised to 27°C, the number of beats produced will be?

- A: 2
- B: 4
- C: 6
- D: 8

17. A lift is ascending with acceleration g/3. What will be the time period of a simple pendulum suspended from its ceiling, if its time period in stationary lift is T?

- A: $\sqrt{3}T/2$
- B: $\sqrt{3}T/4$
- C: T/2
- D: T/3

18. A particle executes simple harmonic motion between x = - A and x = + A. The time taken for it to go from 0 to A/2 is T_1, and to go from A/2 to A is T_2. Then, ?

- A: $T_1 < T_2$
- B: $T_1 > T_2$
- C: $T_1 = T_2$
- D: $T_1 = 2T_2$

19. Two particles A and B of equal masses are suspended from two massless springs of spring constants k_1 and k_2 respectively. If the maximum velocities during oscillations are equal, the ratio of amplitudes of A and B is?

- A: $(k_1/k_2)^{1/2}$
- B: k_1/k_2
- C: $(k_2/k_1)^{1/2}$
- D: k_2/k_1

20. A spring balance has a scale that reads 50 kg and the length of the spring at that point is 20 cm. A body suspended from the spring, when displaced and released, oscillates with a period of 0.6 s. The weight of the body is?

- A: 219 N
- B: 185 N
- C: 132 N
- D: 98 N

TEST-4

1. **What is the beat frequency produced when the following two waves are sounded together? $x_1 = 10 \sin (404\pi t - 5\pi x)$, $x_2 = 10 \sin (400\pi t - 5\pi x)$.**

   - A: 2
   - B: 4
   - C: 6
   - D: 8

2. **Time period of a mass attached to a spring and undergoing simple harmonic motion is given by?**

   - A: $t = \pi\sqrt{\frac{m}{k}}$
   - B: $t = 2\pi\sqrt{\frac{k}{m}}$
   - C: $t = 2\pi\sqrt{\frac{m}{k}}$
   - D: $t = m\sqrt{\frac{2\pi}{k}}$

3. **Two similar waves of equal frequency travelling in opposite direction produce?**

   - A: Interference
   - B: Beats
   - C: Stationary waves
   - D: Homologous waves

4. **In a Simple Harmonic Motion with a radius' x_o', the velocity of the particle at any point is:**

   - A: $v=\omega(x_o^2-x^2)^{1/2}$
   - B: $v=\omega(x_o^2-x^2)$
   - C: $v=\omega(x_o-x)^{1/2}$
   - D: $v=\omega(x-x_o)^{1/2}$

5. **Speed of sound waves depend on which of the following?**

   - A: Compressibility of the medium.
   - B: Inertia of the medium.
   - C: Both compressibility and inertia of the medium.
   - D: Sound waves speed is constant and independent of the compressibility or inertia of the medium.

6. **One degree Celsius rise in temperature produces approximately how much increase in the speed of the sound?**

   - A: 0.28 m/s
   - B: 0.36 m/s
   - C: 0.49 m/s
   - D: 0.61 m/s

7. **If a medium is more compressible than the medium x, then the speed of sound in that medium as compared to x would be?**

   - A: Lower
   - B: Higher
   - C: Same
   - D: Could be higher or lower.

8. What is the minimum length of a tube open at both ends that resonates with tuning fork of frequency 350 Hz? (Velocity of sound in air = 350 m/s).

- A: 25 cm
- B: 50 cm
- C: 75 cm
- D: 100 cm

9. The equation of a simple harmonic wave is given by $y = 5 \sin \pi/2 (100t - x)$, where x and y are in metre and time is in seconds. The period of the wave in seconds will be?

- A: 0.5 s
- B: 0.15 s
- C: 0.04 s
- D: 0.01 s

10. In stationary waves, when antinodes are at their extreme position the energy stored in them is?

- A: Stationary waves do not store energy.
- B: Kinetic Energy.
- C: Potential Energy.
- D: A mix of kinetic and potential energy.

11. The frequency of a tuning fork is 256 Hz. The velocity of sound in air is 344 ms^{-1}. The distance travelled (in metres) by the sound during the time in which the tuning fork completes 32 vibrations is?

- A: 19
- B: 43
- C: 88
- D: 129

12. Speed of sound through a gas is measured as 340m/s at pressure P_1 and temperature T_1. What will be the speed of sound if pressure of gas is doubled but the temperature is kept constant?

- A: 342m/s
- B: 340m/s
- C: 170m/s
- D: 680m/s

13. Time period of a pendulum depends on which of the following?

Length of the pendulum

Acceleration due to gravity

Mass of the pendulum

- A: i only
- B: i and ii
- C: i and iii
- D: i, ii and iii.

14.

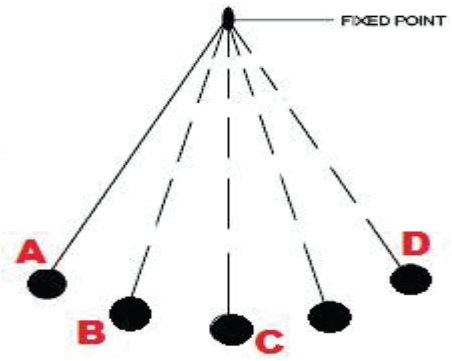
A mass of 0.5 kg moving with a speed of 1.5 m/s on a horizontal smooth surface collides with a nearly weightless spring of force constant k = 50 N/m. The maximum compression of the spring would be

- A: 0.15 m
- B: 0.12 m
- C: 1.5 m
- D: 0.5 m

15. When the length of simple pendulum is doubled. find the ratio of of new frequency to the old frequency?

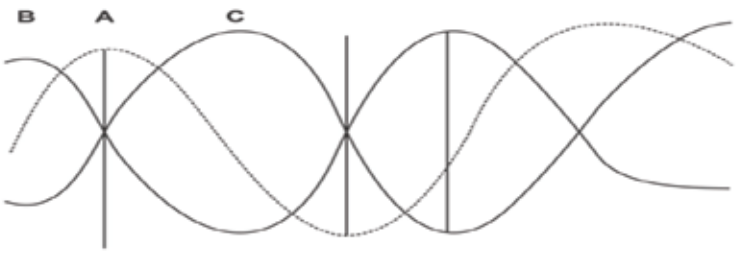
- A: 1/4
- B: 1/2
- C: $1/(2)^{1/2}$
- D: $(2)^{1/2}$

16. For the pendulum give below, at which point the velocity of the bob is minimum?



- A: A
- B: B
- C: C
- D: Both A and D.

Three progressive waves A, B and C are shown in the figure.



17. With respect to A, the progressive wave:

- A: B lags by π/2 and C leads by π/2
- B: B lags by π and C leads by π
- C: B leads by π/2 and C lags by π/2
- D: B leads by π and C lags by π

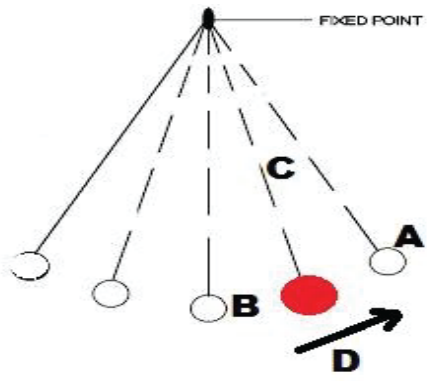
18. A body performs SHM with a period of 0.063 s. The max speed in this case is 3.0m/s . What will be the angular frequency?

- A: 16
- B: 48
- C: 96
- D: 100

19. Two waves have constructive interference when path difference Δs =?

- A: nλ/2 where n = set of integers.
- B: nλ where n = set of integers.
- C: (2n+1)λ/2 where n = set of integers.
- D: (2n+1)λ/3 where n = set of integers.

20. If the arrow shows the direction of motion of the pendulum at the instant marked red. What is the direction of the acceleration at that point?



- A: Towards A
- B: Towards B
- C: Towards C
- D: Towards D

OPTICS

TEST-1

1. Resolving power is expressed as inverse of _____ .

- A: Radius of lens
- B: Magnification
- C: Focal length
- D: Minimum angle subtended at instrument by two points.

2. is a surface where all the points have same phase of vibration.

- A: Wave plane
- B: Wavelength
- C: Wave Front
- D: None of the above

3. The normal human eye can focus a sharp image of an object on the eye if the object is located at certain distance called:

- A: Least point
- B: Near point
- C: Far point
- D: Distinct point

4. A narrow slit produces a sequence of bright and dark fringes with a _____ region at the center of the pattern.

- A: Dark
- B: Bright
- C: Shining
- D: None of the above

5. Sodium chloride in a flame gives out pure

- A: Green light
- B: Yellow light
- C: Red light
- D: Blue light

6. Light wave propogates in space by the _____ .

- A: Stationary wave fronts
- B: Motion of wave fronts
- C: Parallel wave fronts
- D: None of the above

7. A line normal to the wave front is called _____ .

- A: Ray of light
- B: Light source
- C: Moving light source
- D: Ray point

8. Central spot of Newtons rings are

- A: Dark for large wavelength
- B: Bright
- C: Bright for large wavelength
- D: Dark

9. The study of atomic structure of crystals by X rays was initiated in 1914 by.

- A: W.H Bragg and W.L Bragg
- B: W.L Bragg and W.I Bragg
- C: W.H Bragg and W.I Bragg
- D: W.H Bragg and Albert A. Michelson

10. The property of bending of light around an obstacle and spreading of light waves into geometric shadow of an obstacle is called:

- A: Diffraction
- B: Polarization
- C: Quantization of light
- D: Interference of light

11. The amplitude of the resultant wave after interference would be _____ in case of destructive interference.

- A: Similar
- B: Greater
- C: Lesser
- D: None of the above.

12. The magnification of the virtual image of convex lens can be given by?

- A: M = 1 - d/f
- B: M = 1 - f/d
- C: M = 1 + f/d
- D: M = 1 + d/f

13. Proposed that light is a form of energy that travels in space as waves.

- A: Huygen
- B: Newton
- C: Einstein
- D: Galelio

14. The value of least distance vision for human eye is :

- A: 20cm
- B: 30cm
- C: 25cm
- D: 50cm

15. In the normal adjustment of compound microscope, the eye piece is positioned so that the final image is formed at :

- A: Optical center
- B: Infinity
- C: Principle focus
- D: Near point

16. According to _____ principle, every point of a wave front is a source of a secondary wave front.

- A: Einstein's
- B: Huygen's
- C: Euler's
- D: Young's

17. When seeing through Naked eyes, the aparent size of the object depends on which of the following?

- A: Lens
- B: Size of retina
- C: Angle subtended
- D: Iris

18. The branch of physics related to light is called _____ .

- A: Light mechanics
- B: Optics
- C: Atomic physics
- D: Plasma physics

19. Optical active crystals rotates the

- A: vibrating plane
- B: polarization plane
- C: interference plane
- D: diffraction plane

20. A light with a wavelength of 600nm passes between two slits with a seperation of 2mm. The distance between the screen and slits is found to be 200cm. What should be the distance between two adjacent bright fringes?

- A: 1mm
- B: 0.6 mm
- C: 1.2 mm
- D: 4 mm

TEST-2

1. **The angular magnification "MA" produced by the combination of a particular eyepiece and objective can be calculated with**

   - A: $MA = \frac{f_o}{f_e}$
   - B: $MA = \frac{f_e}{f_o}$
   - C: $MA = \frac{2\pi f_o}{f_e}$
   - D: None of these

2. **The distance between two adjacent bright and dark fringes is mathematically written as:**

   - A: $\Delta Y = iL/d$
   - B: $\Delta Y = i/dL$
   - C: $\Delta Y = \gamma L/d$
   - D: $\Delta Y = d/\gamma L$

3. **In Michealson method to measure speed of light, the relation of "c" is:**

   - A: c = 8fd
   - B: c = 12 fd
   - C: c = 4 fd
   - D: c = 16 fd

4. **The distance between two consecutive bright or dark fringes, in Young's Double slit experiment, is given by:**

   - A: $\Delta y = \lambda L/3d$
   - B: $\Delta y = \lambda L/2d$
   - C: $\Delta y = 2\lambda L/d$
   - D: $\Delta y = \lambda L/d$

5. **When two waves travel in the same medium they will interfere:**

   - A: Constructively
   - B: Destructively
   - C: Both the above can happen according to the phase.
   - D: The waves can not interfere.

6. **For two convex lens compound Microscope, the Magnification is given by formula?**
   $M_1 = q/p$ and f_e is the focal length of eye piece.

   - A: $M = \frac{q}{p}\left(1 + \frac{f_e}{d}\right)$
   - B: $M = \frac{p}{q}\left(1 + \frac{f_e}{d}\right)$
   - C: $M = \frac{p}{q}\left(1 + \frac{d}{f_e}\right)$
   - D: $M = \frac{q}{p}\left(1 + \frac{d}{f_e}\right)$

7. Polarization of light exhibited the nature of life as?

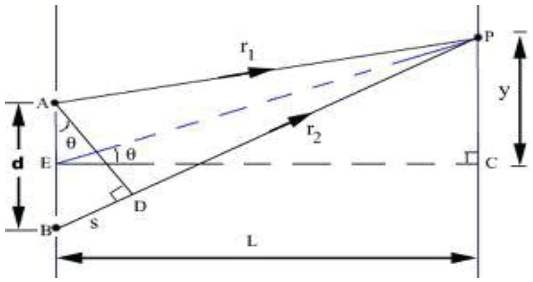
- A: Longitudnal wave
- B: Compressional wave
- C: Electromagnetic wave
- D: Transverse wave

8. The concentration of sugar solution can be determined by?

- A: Plane polarized light
- B: Unpolarized light
- C: Interference of light
- D: Diffraction of light

9. It was _____ whose experimental works proved that light travels as waves.

- A: Einstein
- B: Newton
- C: Huygen
- D: Young



10. In the figure above, the value of y for bright fringes can be given by;

- A: $y = 2L\lambda / d$
- B: $y = mL\lambda / d$
- C: $y = mL\lambda / 2d$
- D: $y = 2mL\lambda / 3d$

11. Suppose in a young's double slit experiment, the slit seperation is 0.25cm, the distance between screen and slits is 100cm, the wavelength of light is 737.5nm and the distance from center to the bright fringe is 0.059cm. What is the number of that bright fringe?

- A: 4th
- B: 3rd
- C: 2nd
- D: 1st

12. The resolution details of a microscope are dependant on which of the following?

- A: Distance of object
- B: Width of objective
- C: Magnification
- D: All of the above

13. An object 15cm from a lens produces a real image 30 cm from the lens. What is the focal length of the lense?

- A: +15 cm
- B: + 20 cm
- C: +10 cm
- D: +25 cm

14. The refractive index of a prism can be measured by which of the following instruments?

- A: Telescope
- B: Spectrometer
- C: Collimator
- D: Young's double slit equipment

15. Michelson devised the Michelson's interferometer in

- A: 1882
- B: 1889
- C: 1891
- D: 1881

16. The Monochromatic light has which of the following properties:

- A: Single wavelength
- B: Single color
- C: Single frequency
- D: All of the above.

17. The information from one to another can be transmitted very safely and easily by:

- A: Copper wire
- B: Aluminium wire
- C: Optical fibers
- D: Photodiode

18. Image of object placed inside focal length of a convex lense will be largest and clearest, when it is at the :

- A: Nearest point
- B: Less than 25 cm
- C: Greater than 25 cm
- D: Infinity

19. In diffraction of light round an obstacle,the angle of diffraction is increased when:

- A: The wavelength of incident light wave is decreased
- B: The amplitude of the incident light wave is increased
- C: The wavelength of incident light wave is increased
- D: The amplitude of the incident light wave is decreased

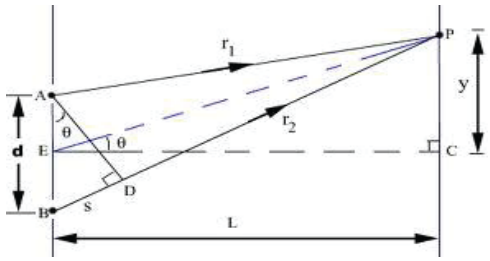
20. In the Galileo telescope the final image seen through the eyepiece is?

- A: Inverted.
- B: Erect.
- C: Virtual and Inverted.
- D: Erect and virtual.

TEST-3

1. **For a simple microscope, magnification is 10 and distance of the image is 45cm. What is the focal length of the lens?**

   - A: 9 cm
   - B: 6 cm
   - C: 5 cm
   - D: 18 cm



2. **In the figure given above, the value of "y" for dark fringes is given by**

   - A: $y = \left(m + \frac{1}{3}\right)\frac{\lambda L}{d}$
   - B: $y = (m+2)\frac{\lambda L}{d}$
   - C: $y = \left(m + \frac{1}{2}\right)\frac{\lambda L}{d}$
   - D: None of the above

3. **Which of the following can be utilized with the spectrometer so that it can be employed for measuring the wavelength of the light?**

   - A: Microscope
   - B: Convex lens
   - C: Concave mirror
   - D: Diffraction grating

4. **Refractive index of a material depends on which of the following?**

   - A: Flexibility of the medium
   - B: Specific heat of the medium
   - C: Pressure of the medium
   - D: Density of the medium

5. **The magnification of astronomical telescope is**

   - A: $M = \frac{f_e}{f_o}$
   - B: $M = \frac{f_e^2}{f_o}$
   - C: $M = \frac{f_o^2}{f_e}$
   - D: $M = \frac{f_o}{f_e}$

6. In Young's double slit experiment, the relation for dark fringes is:

- A: $(m + 1/2)\ \lambda = d \sin \Theta$
- B: $(m + 1/3)\ \lambda = d \sin \Theta$
- C: $m\ \lambda = d \sin \Theta$
- D: $1/2\ m\ \lambda = d \sin \Theta$

7. Step-index optical fiber is generally made by doping high-purity of

- A: Plastic
- B: Simple glass
- C: Titanium glass
- D: fused silica glass

8. Which of these consist of a metallic tube with a convex lens at one end and adjustable slit on the other end?

- A: Collimator
- B: Turn table
- C: Telescope
- D: All of them

9. The angle subtended by any side of the eight sided mirror at the centre is

- A: $\frac{2\pi}{8}$
- B: $\frac{4\pi}{8}$
- C: $\frac{2\pi}{7}$
- D: $\frac{2\pi}{6}$

10. What are the units of optical power of a lens?

- A: Decipher
- B: Diopter
- C: Watt
- D: It has no units.

11. In order to observe the interference of light, the following must be done:

The light beam must be monochromatic;

The light beams must be coherent;

The seperation between slits must be very large.

- A: 1 only
- B: 1 and 3 only
- C: 1 and 2 only
- D: 1, 2 and 3

12. The beautiful colors formed by the oil film on the surface of water is result of _____ of light.

- A: Refraction
- B: Reflection
- C: Interference
- D: None of the above.

13. A good telescope has an objective of _____ focal length and _____ aperture.

- A: Small; Large
- B: Long; Large
- C: Long; Small
- D: Small; Small

14. In Young's double slit experiment, the relation to get a bright fringe is:

- A: m (λ + 2) = d sin Θ
- B: m (λ + 1/2) = d sin Θ
- C: (m + 2) λ = d sin Θ
- D: m λ = d sin Θ

15. A wave front emitted from a slit will be _____ wavefront.

- A: Cylindrical
- B: Spherical
- C: Linear
- D: None of the above

16. Wavefronts have points with same_____ .

- A: Time period
- B: Amplitude
- C: Phase
- D: All of the above

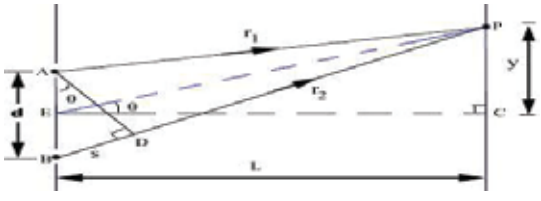
17. In a compound microscope the magnification by objective = 20 , magnification by eye piece =-11 the total magnification is :

- A: M =-220
- B: M = -0.19
- C: M = -0.05
- D: M=220

18. Coherent light sources refer to sources with the following features:

- A: Monochromatic with constant phase difference
- B: Monochroamtice with variable phase difference
- C: Non- monochroamtice with variable phase difference
- D: Non- monochroamtice with constant phase difference

19. What should be the distance between Slits and screen "L" for a light of wavelength of 589nm, the slit seperation to be 1mm so that the width of bright fringe is 1.33mm?



- A: 0.5 m
- B: 1 m
- C: 2.25 m
- D: 3.8 m

20. An oil film floating on water surface exhibits colour pattern due to phenomenon of ?

- A: Interference
- B: Polarization
- C: Diffraction
- D: Surface tension

TEST-4

1. **In Youngs double slit expriement if the separation of the slits is increased by two times, the fringe spacing?**

   - A: Remains same.
   - B: Decrease by half.
   - C: Increase by two times.
   - D: Increase by four times.

2. **The linear magnification produced by a lens is defined as the ratio of the:**

   Size of image to the size of object

   Size of the lens to the size of the object

   Size of the lens to the size of the image

   - A: I only
   - B: II only
   - C: III only
   - D: I,II,III

3. **The most common method to produce polarized light through dichroic substances is?**

   - A: Reflection from other surfaces
   - B: Refraction through crystals
   - C: Scattering by small particles
   - D: Selective Absorption

4. **The focal length of concave lens of power -2.D is**

   - A: 5m
   - B: -0.5m
   - C: 0.5cm
   - D: 0.005m

5. **During Young's double slit experiment, the dark fringes are formed due to :**

   - A: Constructive Interference
   - B: Destructive Interference
   - C: Refrection
   - D: Total internal reflection

6. **The first attemts to measure the speed of light were done by which of the following scientists?**

   - A: Newton
   - B: Einstein
   - C: Graham Bell
   - D: Galileo

7. **A usual way of obtaining a plane wave is to place a point of light source infront of a _____ .**

   - A: Concave lens
   - B: Convex lens
   - C: Concave mirror
   - D: Convex mirror

8. For a young person, the near point is situated approximately how many cm from the eye.

- A: 10 cm
- B: 15 cm
- C: 20cm
- D: 25 cm

9. The layer with less refractive index in multi mode step index is called?

- A: Cladding
- B: Monochrome
- C: Index fibre
- D: Second step

10. If magnification of objective lens and eye piece are M_1 and M_2respectively. The magnification of the compound microscope can be given by?

- A: $M = M_1.M_2$
- B: $M = M_1 + M_2$
- C: $M = M_1 - M_2$
- D: $M = M_1/M_2$

11. The resolving power of a grating spectrometer is give by?

- A: $R = \lambda/\Delta\lambda$
- B: $R = \Delta\lambda/\lambda$
- C: $R = \Delta\lambda/\lambda^2$
- D: $R = \lambda^2/\Delta\lambda$

12. In youngs double slit experiment, slit separation d = 0.65cm, distance between slit and screen is L = 200cm and distance of fringe separation is y = 0.13cm , wavelength of light ray will be :

- A: $\lambda = 1.33 \times 10^{-3}m$
- B: $\lambda = 3.25 \times 10^{-7}m$
- C: $\lambda = 4.55 \times 10^{-3}m$
- D: $\lambda = 5.11 \times 10^{-3}m$

13. For interference of light waves to take place, the required condition is:

- A: The path difference of light waves from the two sources must be large.
- B: The interfering waves must be non-coherent.
- C: The light waves may come from different sources.
- D: The light waves may come from two coherent sources.

14. The index of refraction of a material is given by?

- A: n = c * v
- B: n = c/v
- C: n = v/c
- D: $n = c^v$

15. In diffraction grating, the first order image of the grating will be formed when d sin Θ = ?

- A: 0
- B: 1
- C: λ
- D: λ/2

16. Optical microscopes have refractive glass and occasionally of

- A: Crystal and plastic
- B: Crystal and Quartz
- C: Plastic and Quartz
- D: Glass and Quartz

17. The Telescope is made of an objective of focal length 20cm and eye piece of 5.0 cm both convex . Its angular magnification is ?

- A: 5.4 cm
- B: 9.5 cm
- C: 4.0 cm
- D: 4.5 cm

18. Magnifying power is also known as ?

- A: Angular magnification
- B: Linear Magnification
- C: Subtended Magnification
- D: All of the above.

19. The property of light to bend around obstacles and spread into geometrical shadow is called?

- A: Reflection
- B: Interference
- C: Refraction
- D: Diffraction

20. Which of the following results in the power loss in the fibre optics?

- A: Scattering
- B: Absorption
- C: Splice and connector loss
- D: All of the above

HEAT & THERMODYNAMICS

TEST-1

1. Which of the following explains the behavior of gasses?

- A: Bernoulli's theorum.
- B: Isothermal processes
- C: Kinetic theory.
- D: Borwnian motion.

2. Energy can be added to a gas in a cylinderical container through?

- A: Heat transfer
- B: Mechanical work
- C: Applying pressure
- D: All of the above.

3. Which of the following is true for an isothermal process?

- A: Product of P & V remains constant.
- B: Change in internal energy = 0
- C: Q=W
- D: All of the above.

4. Which of the following statement is true?

1. One kilogram of different substances contains different number of molecules.
2. One mole of different substances contains same number of molecules.

- A: A only.
- B: B only.
- C: Both A & B,
- D: Both A & B are incorrect.

5. Triple point of water is?

- A: Independent of the temperature and pressure.
- B: Dependent on the temperature and pressure.
- C: The point where all three states of water co-exist.
- D: Both B & C.

6. Which of the following is the definition of the molar specific heat of a substance?

- A: Heat required to raise the temperature of 1 Kg of the substance through 1 K.
- B: Heat required to raise the temperature of 1 mole of the substance through 1 K.
- C: Heat required to raise the temperature of 1 mole of the substance through 1 C.
- D: Heat required to raise the temperature of 1 Kg of the substance through 1 C.

7. The unit of temperature in base unit is :

- A: Celsius
- B: Degree
- C: Kelvin
- D: Fahrenheit

8. Which of the following is true about the pressure of the gasses?

- A: $P \alpha K.E$
- B: $P \alpha Temperature$
- C: $P \alpha V$
- D: Only A & B

9. Thermal pollution is an inevitable consequence of?

- A: First law of thermodynamics.
- B: Second law of thermodynamics.
- C: Both A & B.
- D: Charles Law.

10. In the general equation PV=nRT, n is the number of moles of gas. Which one of the following represents the relationship of n?

- A: NxN_A
- B: N/N_A
- C: N_A
- D: nN_A

11. Heat can not be converted entirely into work. This statement can be derived from?

- A: First law of thermodynamics.
- B: Second law of thermodynamics.
- C: Third law of thermodynamics.
- D: Both A & B.

12. In adiabatic process PV^{Υ}= Constant. Υ is defined as?

- A: Boyle's constant.
- B: Ratio of molar specific heat of gas at constant pressure to molar specific heat at constant volume.
- C: Ratio of molar specific heat of gas at constant pressure to molar specific heat at constant temperature.
- D: Ratio of molar specific heat of gas at constant temperature to molar specific heat at constant volume.

13. What is 273K on celcius scale ?

- A: 0.15^oC
- B: -0.15^oC
- C: 273^oC
- D: -273^oC

14. Boyle's law state that?

- A: Pressure is directly proportional to volume at constant temperature.
- B: Pressure is inversely proportional to volume at constant temperature.
- C: Pressure is directly proportional to volume at variable temperature.
- D: Pressure is inversely proportional to volume at variable temperature.

15. Gas pushes the piston doing work of 700J. If the process is isothermal which of the following is true?

- A: Heat of 700J is transferred to the surroundings.
- B: Heat of 700J is transferred to the system.
- C: Temperature of the system decreases.
- D: Heat transfer in this process is less than 700J.

16. Which of the following is a basic postulate/s of the mathematical model of gasses?

- A: Gass molecules are always in random motion.
- B: Gas molecules do not exert force on each other except during a collision.
- C: V = T * Constant
- D: Both A & B

17. All natural processes move towards?

- A: Stable net entropy.
- B: Decrease in net entropy.
- C: Increase in net entropy.
- D: None of the above.

18. When heat is added to the system it appears as?

- A: Increase in internal energy of the system and work done on the system by the surroundings.
- B: Decrease in internal energy of the system and work done by the system on the surroundings.
- C: Increase in internal energy of the system and work done by the system on the surroundings.
- D: Decrease in internal energy of the system and work done on the system by the surroundings.

19. If a gass is compressed through a 300 J work. The internal energy of the system for adiabatic process will?

- A: Increase by 300 J
- B: Decrease by 300 J
- C: Remain same
- D: Need information about the heat exchanged in the process.

20. Which of the following is a basic postulate of the mathematical model of gasses?

- A: Molecules do not exert force on each other except during a collision.
- B: PV = nRT
- C: Gasses have inelastic collisions with the boundary of the container.
- D: All of the above.

TEST-2

1. **In a Carnot engine, when $T_2 = 0^0C$ and $T_1 = 200^0C$, its efficiency is n_1. When $T_1 = 0^0C$ and $T_2 = -200^0C$, efficiency is n_2, what is n_1/n_2 ?**

   - A: 0.57
   - B: 0.64
   - C: 0.73
   - D: None of the above.

2. **Boltzman constant relates which two values?**

   - A: Volume of the gas with energy.
   - B: Energy of the gas with temperature.
   - C: Volume of the gas with temperature.
   - D: Energy of the gas with moles

3. **A gas sample contains three molecules each having speeds 1m/s, 2m/s and 3m/s. What is the mean square speed?**

   - A: 14/3 m/s
   - B: 6 m/s
   - C: 2 m/s
   - D: $(14/3)^{1/2}$ m/s

4. **If 'Q' is the amount of heat supplied to a system and ' W' is work done , then change in internal energy can be defined as:**

   - A: Q-W
   - B: Q/W
   - C: W/Q
   - D: 1+ Q/W

5. **In an adiabatic process, a gas expands against a piston. Which of the following statement is true?**

   - A: No work is done in the process.
   - B: Internal energy remains constant.
   - C: Molecules linear velocity increases.
   - D: Temperature of the gas falls.

6. **In a thermodynamic process, pressure of a fixed mass of the gas is changed in such a manner that the gas molecules give out 30 J of heat. Also, 10 J of work is done on the gas. If the internal energy of the gas was 40 J, what will be the final internal energy?**

   - A: 20 J
   - B: -20 J
   - C: 80 J
   - D: 60 J

7. **Boltzman constant is defined as $k = R / N_a$. R and N_a are?**

   - A: R=gas constant, N_a=Number of moles of gas
   - B: R=Rigidity of gas, N_a=Number of moles of gas
   - C: R=gas constant, N_a=Absolute number of moles at temperatue T
   - D: R=gas constant, N_a=Avogrado number

8. For a given temperature speed of gas molecules is?

- A: $v = \sqrt{\frac{3kT}{2m}}$
- B: $v = \sqrt{\frac{2kT}{3m}}$
- C: $v = \frac{3kT}{2m}$
- D: $v = \sqrt{\frac{3kT}{m}}$

9. Which of the following is the expression of root mean square speed of a gas having n number of molecules contained in a container?

- A: sq.root $(v_1^2 + v_2^2 + v_3^2 ..... + v_n^2)/N$
- B: $(v_1^2 + v_2^2 + v_3^2 ..... + v_n^2)/N$
- C: sq.root $(v_1 + v_2 + v_3 ..... + v_n)/N$
- D: $(v_1 + v_2 + v_3 ..... + v_n)/N$

10. A heat engine operating according to second law of thermodynamics rejects one fourth of the heat taken from high temperature reservior. What is the percentage efficiency of engine?

- A: 25%
- B: 50%
- C: 75%
- D: 100%

11. A gas at 300K, enclosed in a constainer, is put in a fast moving train. When the train moves, the temperature of gas?

- A: Rises above 300K
- B: Falls below 300K
- C: Remains same.
- D: Become unsteady.

12. H_2 and O_2 both are at thermal equilibrium at temperature 300K. Oxygen is 16 times massive than Hydrogen. Root mean square speed of hydrogen is:

- A: 1/4 root mean square of oxygen
- B: 4 root mean square of oxygen
- C: 1/16 root mean square of oxygen
- D: 16 root mean square of oxygen

13. Two baloons are filled, one with pure He gas and the other by air, respectively. If the pressure and temperature of these balloons are same then the number of molecules per unit volume is :

- A: More in He filled baloon as He is lighter than air.
- B: Same in both baloons.
- C: More in air filled baloon.
- D: in the ratio of 1:5.

14. In a thermodynamic process, pressure of a fixed mass of a gas is changed in such a manner that the gas molecules give out 30 J of heat and 10 J of work is done on the gas. If the initial internal energy of the gas was 40 J, then the final internal energy will be:

- A: 20 J
- B: 30 J
- C: 40 J
- D: 50 J

15. Which of the following is the evidence in favour of kinetic theory?

- A: Diffusion of gases
- B: Brownian motion
- C: Enthalpy
- D: Both A & B

16. The total translational kinetic energy of all the molecules of a given mass of an ideal gas is x times the product of its pressure, and its volume. The value of x is?

- A: 2/3
- B: 1/3
- C: 3/2
- D: 1/2

17. A 50 g cube of ice is added to 500 g of boiling water. Which of the following is most likely to occur?

- A: The ice cube vaporizes before it strikes the bottom of the container.
- B: The water boils more vigorously because the hot water draws cold from the ice cube.
- C: The water in the container stops boiling during the phase change of the ice to water.
- D: The more dense ice cube sinks in the less dense hot water.

18. Pressure exerted by gas on the walls of a cylinderical container can be defined as?

- A: Momentum transferred to the walls due to to intra-collion of gas molecules.
- B: Phenomena due to the fact that distance of gas molecules is much larger than the size of molecules themselves.
- C: Momentum transferred to the walls due to to collion of gas molecules with the wall.
- D: Diffusion of gases in a the cylinderical container.

19. Work done by an expanding piston can be calculated by?

- A: P * Change in volume of the gas.
- B: Area under the PV curve.
- C: $\int_a^b Pdv$
- D: All of the above.

20. First law of thermodynamics under adiabatic conditions can mathematically be written as:

- A: Q= W
- B: Q= ΔU
- C: W= -ΔU
- D: Q=U+W

TEST-3

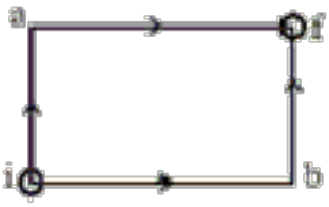
1. If absolute temperature of a gas container is increased by 4 times and the volume of the container is decreased by 5 times, the pressure of the gas on the container?

- A: Increase by 4 times.
- B: Increase by 5 times.
- C: Increase by 20 times.
- D: Decrease by 20 times.

2. The pressure and density of a gas is changed adiabatically from (P1 & ρ_1) to (P2 & ρ_2). If $\rho_2/\rho_1 = 32$ then the ratio of P2/P1 should be? Assume Υ=7/5.

1. A: 16
2. B: 32
3. C: 64
4. D: 128

3. When a system is taken from state i to state f along the path iaf, it is found that Q = 50 J and W = 20 J. Along the path ibf, if Q = 36 then W = ?



1. A: 66 J
2. B: 14 J
3. C: 6 J
4. D: 16 J

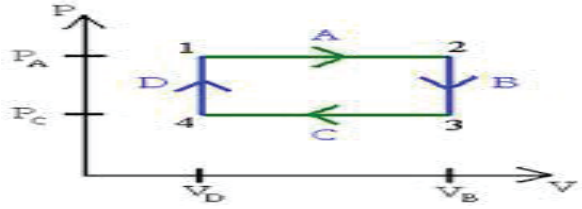
4. A Carnot engine whose low temperature reservoir is at 27^0C has an efficiency of 50%. If it is desired to increase the efficiency to 60% then, by how many degrees should the temperature of the high temperature reservoir be increased?

1. A: 600 K
2. B: 500 K
3. C: 250 K
4. D: 150 K

5.A Carnot engine absorbs an amount Q of heat from a reservoir at an absolute temperature T and rejects heat to a sink at a temperature of T/3. The amount of heat rejected is :

1. A: Q/4
2. B: Q/3
3. C: Q/2
4. D: 2Q/3

6.Which of the following statement is true for the figure below,



1. A: Work done in moving from 1-3 is more than work done in moving from 3-1.
2. B: Work done in moving from 1-3 is same as work done in moving from 3-1.
3. C: In moving from 1-3 surroundings do work on the system.
4. D: Total work done by the system is zero.

7. Heat engine performs 100 J of work and rejects 400 J of heat to the sink. What is efficiency of the engine?

1. A: 20%
2. B: 30%
3. C: 40%
4. D: 45%

8. For a heat engine 'A' ratio of Q_2 to Q_1 is 2/3 while that of heat engine 'B', ratio of Q_2 to Q_1 is 1/3. What is the value of $\eta_A : \eta_B$?

1. A: 1:3
2. B: 1:2
3. C: 2:3
4. D: 2:1

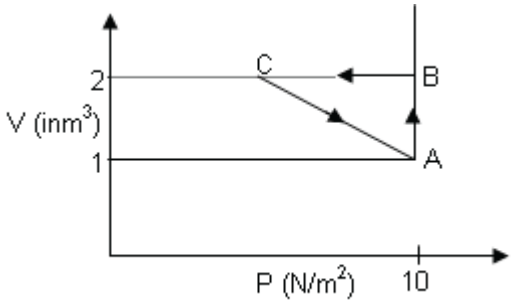
9. At triple point of water , the pressure of gas is 2680 Pa. By changing the T the pressure changed to 4870 Pa. The value of T is?

1. A: 496 K
2. B: 438 K
3. C: 0
4. D: 438 F

10. If absolute temperate of a gas container is increased by 4 times and the volume of the container is also increased by 4 times, the pressure of the gas on the container?

1. A: Remains same.
2. B: Increase by 4 times.
3. C: increase by 8 times.
4. D: Increase by 16 times.

11. An ideal gas is taken through the cycle A → B → C → A, as shown in figure. If the net heat supplied to the gas in the cycle is 5 J, the work done by the gas in the process. C → A is?



1. A: -5J
2. B: -10J
3. C: -15J
4. D: -20J

12. If velocity of gas particles for two different gases is same. The pressure is directly proportional to? Assume volume of the container is same.

- A: Mass of the gas molecules
- B: Absolute Temperature
- C: Size of piston on the container.
- D: Both A & B.

13. An engine has an efficiency of 1/6. When the temperature of sink is reduced by 62^0C, its efficiency is doubled. Temperature of the source is:

- A: 372^0C
- B: 269^0C
- C: 124^0C
- D: 99^0C

14. Temperature of ideal gas is increased from 120 K to 480 K. If root mean square of velocity is V at 120 K then what is root mean square at 480 K?

1. A: 4V
2. B: 2V
3. C: V/2
4. D: V/4

15. A heat engine according to second law of thermodynamics has 50% efficiency. What will be the temperature of its low temperature reservoir if high temperature reservior is 327 C ?

1. A: 27 C
2. B: 127 C
3. C: 300 C
4. D: 600 C

16. A reversible engine works between two temperatures whose difference is 200 ^{o}C. If it absorbs 746 J heat from source and and rejects 546 J to the sink. What is temperature of the source?

1. A: 100 ^{o}C
2. B: 273 ^{o}C
3. C: 373 ^{o}C
4. D: 473 ^{o}C

17. Translational KE for gas molecules at temperature T for one mole of a gas is?

1. A: (3/2) RT
2. B: (9/2) RT
3. C: (2/3) RT
4. D: (1/3) RT

18. Starting with the same initial conditions, an ideal gas expands from volume V_1 to V_2 in three different ways. The work done by the gas is W_1 if the process is purely isothermal; W_2, if purely isobaric, and W_3 ,if purely adiabatic. Then:

1. A: W2>W1>W3
2. B: W2>W3>W1
3. C: W1>W3>W2
4. D: W1>W2>W3

19. Which of the following is a correct relationship between pressure, density and molecular velocity of gas?

- A: $P = \frac{1}{2}\rho v^2$
- B: $P = \frac{3}{2}\rho v^2$
- C: $P = \frac{1}{3}\rho v^2$
- D: $P = \frac{2}{3}v^2/\rho$

20. Internal energy of the ideal gas is equal to translational KE based on which of the following assumptions?

1. A: Ideal gases expand when heated.
2. B: Molecules of ideal gas exert constant force on each other.
3. C: Molecules of ideal gas exert no force on each other.
4. D: Both A & B